

# Environmental Health Conditions in California Portable Classrooms

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Public Workshops  
June 24-25, 2003



# Agenda

- Schedule
- Contact information
- Purpose
- Results
- Recommendations
- Questions
- Discussion and comments



# Schedule



- **Public Workshops: June 24-25, 2003**
- **Comments due: 5 p.m. Wed., July 9, 2003**
- **Revised report available: ~ July 17, 2003**
- **Air Resources Board meeting: July 24 or 25**
- **Report to Governor and Legislature: August**



# For More Information

- See our web site: <http://www.arb.ca.gov/research/indoor/pcs/pcs.htm>
- Please join the “list serv” at our web site to receive notices and updates
- For Board meeting information, call Jacqueline Cummins at (916) 445 - 0753, or [jcummins@arb.ca.gov](mailto:jcummins@arb.ca.gov), or visit <http://www.arb.ca.gov/board/board.htm#1> prior to the Board meeting.



# Background

- **Mandated by:**
  - Governor's Budget, FY 2000-2001
  - Assembly Bill 2872 (Shelley, 2000), Health & Safety Code § 39619.6
- **Conducted by:**
  - Air Resources Board (ARB)
  - Department of Health Services (DHS)
- **Field work - Research Triangle Institute**
- **Concerns: ventilation, formaldehyde, mold**



# Purpose of Study



- Examine environmental health conditions in portable classrooms in public schools in California.
- Identify the extent of any potentially unhealthful environmental conditions.
- Recommend actions that can be taken to prevent problems found, in consultation with stakeholders.





# Two - Phase Study Design

- Phase I, mail survey (Spring - Summer)
  - 1,000 schools selected randomly
  - 2 portables and 1 traditional classroom per school
  - Questionnaires to teachers and facility managers
  - Formaldehyde samplers to 800 schools



# Phase II

- Phase II, field study (Fall - Winter)
  - 67 schools selected randomly
  - 2 portables, 1 traditional classroom/ school
  - Questionnaires to teachers and facility managers
  - Many indoor and outdoor pollutants measured
  - Indoor conditions and ventilation measured
  - HVAC\*, building, and site inspected
- Statewide, representative samples

\* Heating, Ventilating, and Air-Conditioning system



# Study Results \*

- Ventilation
- Temperature and Humidity
- Air Pollutants
- Floor Dust Contaminants
- Moisture and Mold
- Noise and Lighting



**\* For both portable and traditional classrooms, unless specified otherwise.**



# Ventilation

- Often inadequate:  
 $\text{CO}_2 > 1000$  ppm for more than 40% of hours
- Sometimes seriously deficient:  
 $\text{CO}_2 > 2000$  ppm for about 10% of hours
- Teachers often turned off HVAC due to excessive noise (Port = 68%, Trad = 42%)
- Inspectors frequently found HVAC problems, especially in portable classrooms.



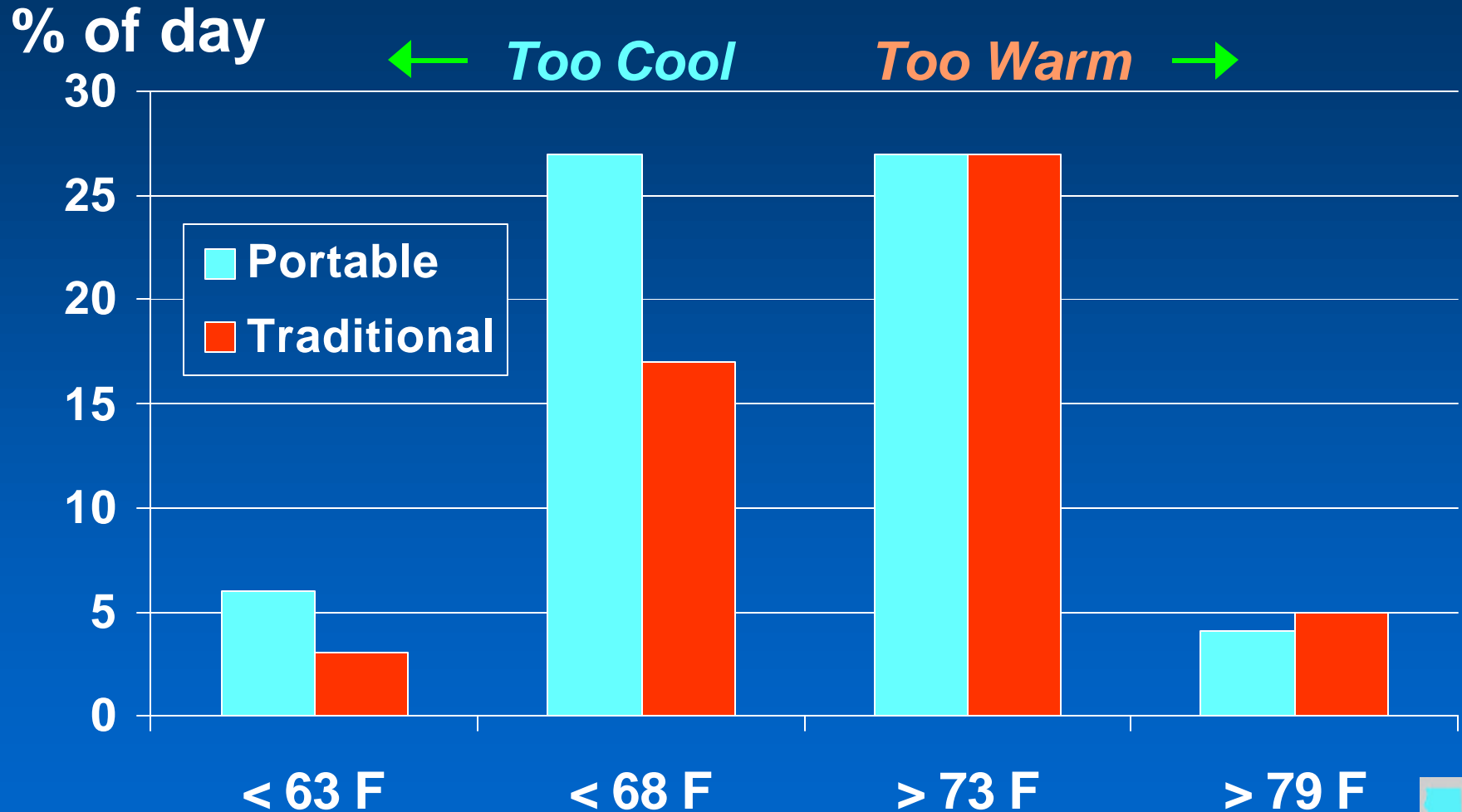
# Example: Dirty HVAC Filter



# Temperature and Humidity

- Thermal comfort standards set by professional society (ASHRAE)
  - Range of acceptable temperature and humidity for heating and cooling seasons
  - Used in building design standards
- Temperature and humidity often outside of acceptable standards range for heating season

# Average Time Outside Thermal Comfort Range



# **Air Pollutants: Aldehydes**

- **Formaldehyde levels**
  - Indoor levels higher than outdoors
  - Portables higher than traditional
  - > 4% of the classrooms exceeded the 8-hour guideline of 27 ppb for acute irritant effects
  - All classrooms exceeded the one-in-a-million risk for excess cancer for lifetime exposure
  - Higher levels in warmer months, rooms w/ higher humidity, and in newer portables
- **Other aldehydes also higher indoors**





**Major aldehyde sources include new cabinets, bookcases, tackboard walls, pressed wood**





# **Air Pollutants:**

## **Volatile Organic Compounds (VOCs)**

- Indoor levels were similar to or less than those in other indoor environments
- Guidelines for acute (immediate) health risks were not exceeded
- Benzene and chloroform levels in some rooms exceeded the one-in-a-million risk for excess cancer; however,
  - Assumes lifetime exposure
  - Outdoor air was a major benzene source



# Air Pollutants: Particles

- Average daily particle counts were similar in portable and traditional rooms.
- Highest particle counts were found in portables, especially for PM2.5 size range.
- Likely sources included:
  - carpets and rugs (more frequent in portables)
  - over half the rooms within 50 ft. of vehicle traffic



**Major source of small particles:  
air intakes near vehicle traffic**



# Floor Dust: Metals

- Dust contaminants are mainly a concern for younger children (increased floor contact)
- Lead levels were elevated
  - Most likely from tracked-in soil or lead paint chips
- Arsenic levels were elevated
  - Natural soil levels are a major source
  - Other possible sources include fertilizer contaminants and wood preservatives



## Peeling paint: potential lead exposure



# Floor Dust: Pesticides

- Pesticides found in all samples
- 6 pesticides found in over 80% of the samples, including chlorpyrifos; 4 more in over 50% of samples.
- Sources appear to be indoor applications or transport from outdoors on shoes & clothes
- Further assessment of results is underway



# Floor Dust: PAHs, Allergens

- Polycyclic Aromatic Hydrocarbons (PAHs)
  - Most of these soot-like compounds were found in over 80% of rooms
  - Levels were relatively low; highest in portables
- Allergens
  - Cat and dog allergens in over 50% of rooms, but nearly all below sensitization levels; main source is clothing
  - Cockroach and dust mite allergens were found infrequently and at low levels

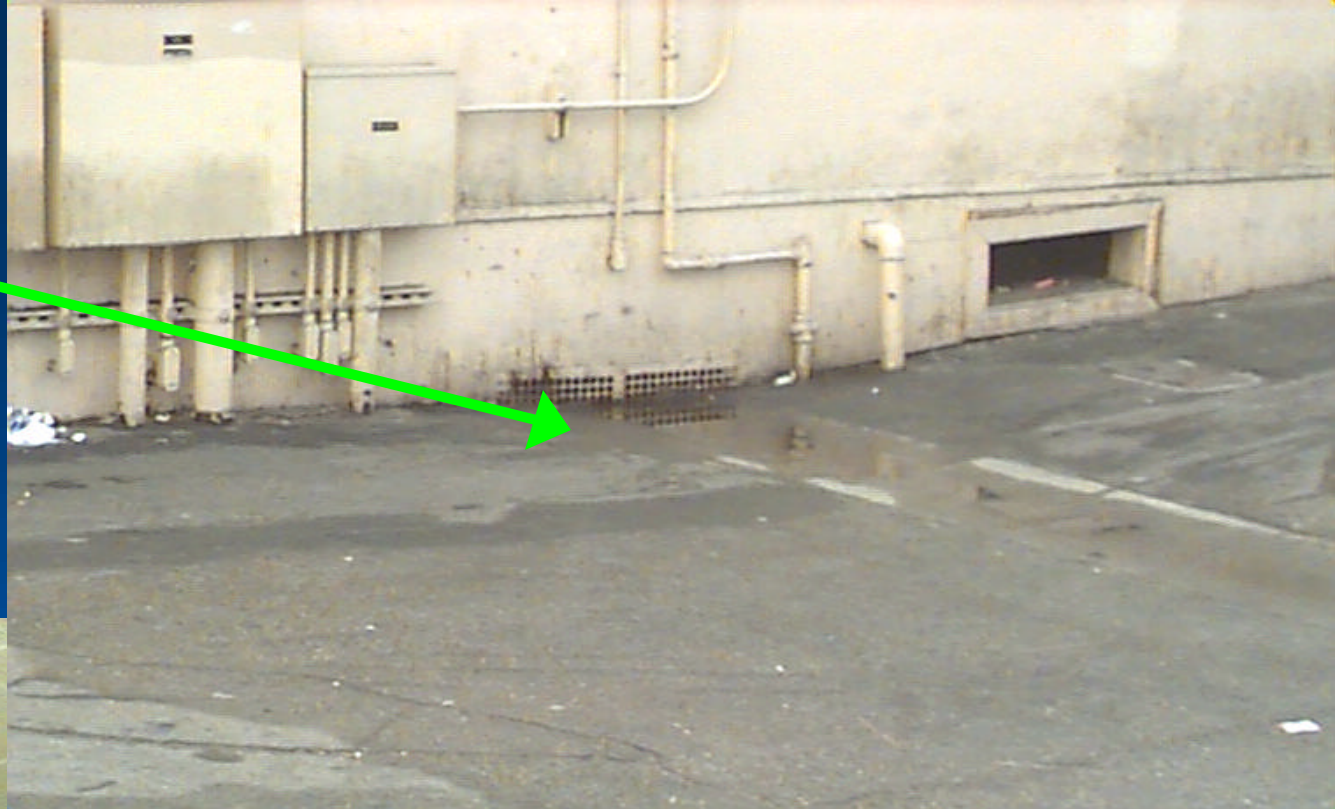
# Moisture and Mold

- Mail survey indicated widespread problems:
  - 69% of teachers reported musty odors.
  - 43% reported current or previous floods / leaks.
  - 11% reported visible mold.
- Field observations
  - 17% of all rooms had excess moisture measured in walls, floor, or ceiling (Port = 12%, Trad = 20%)
  - 3% of portables had visible mold on ceiling (none in traditionals)
  - 3% of all rooms had visible mold on exterior walls





**Poor drainage:  
mold, moisture**



**Leak in HVAC  
and / or roof:  
mold, odors**

## Mold in wallboard



# Noise

- Measured near HVAC return register, HVAC on
- All rooms exceeded the acoustics guideline of 35 decibels (ANSI, WHO)
- Many rooms exceeded community nuisance standard of 55 decibels (Port = 50%, Trad = 38%).
- “Best Practices” goal is 45 decibels.



# Lighting

- Lighting measured at center of room
- About 1/3 of rooms do not meet professional guideline of 50 foot-candles for low contrast materials
- Some rooms do not meet guideline of 30 foot-candles for high contrast materials (Port = 9%, Trad = 4%)





# Conclusions

- Many schools are not models of hygiene or healthfulness, and require improvement.
- However, severe environmental health problems are not widespread in California's public schools.
- Environmental problems generally fall into one of these key areas:
  - inadequate classroom fresh-air ventilation;
  - unnecessary or uncontrolled sources of contaminants;
  - unchecked moisture intrusion; and
  - ineffective cleaning, maintenance, or repair practices.





# Recommendations

- **Group 1: High Priority, High Benefit Actions with Relatively Low Cost**
- **Group 2: Priority Approaches with Potentially Substantive Costs**
- **Group 3: Future Priorities**



# **Group 1**

## **High Priority/High Benefit, Relatively Low Cost**

- **Bring schools into compliance w/ existing state regulations.**
- **Start with “self-assessments” of basic safety and health conditions.**
- **Incorporate “Best Practices”.**
- **Expand the design review by DSA.**
- **Site portable classrooms away from busy roads and areas that experience flooding.**
- **Promote effective classroom cleaning.**





# Group 2

## Priority Approaches, Potentially Substantive Costs

- Require IEQ Management Plans and Integrated Pest Management Programs.
- Establish new building commissioning procedures.
- Assure preventive maintenance.
- *Lead-Safe Schools* training for school maintenance staff; *Lead-Safe* practices during modernization.
- Develop State-level chemical exposure guidelines or standards for classrooms/children.



# **Group 3**

## **Future Priorities**

- **Identify stable, long-term funding sources.**
- **Develop a Training and Certification Program for school facility managers.**
- **Establish a state-level IEQ-in-Schools outreach group.**
- **Assess noise impact; consider school noise guideline.**
- **Improve State school facility inventory and database.**
- **Retire unserviceable, older portable classrooms.**
- **Re-design portable classrooms from the ground up.**



# THANK YOU



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